

INTERMEDIATE PV SYSTEM DESIGN and INSTALLATION WORKSHOP

About the Workshop

As photovoltaics (PV) continues to grow in popularity, increasing number of contractors and specialists have incorporated PV into their business plans. If solar is part of your professional portfolio, this workshop will help you develop the specialized knowledge necessary to compete in this expanding market. This training provides an intensive overview of solar electric generation, system design and installation, compliance with the National Electrical Code (NEC) and incentives available for commercial and residential applications.



Workshop Content

PV System Design and Installation

Learn about the basic effects of irradiance, temperature, orientation, proper sizing and shading on PV systems. (1 hour)



Current PV Products

Review the types of products on the market and how to choose those products that best meet the customer's needs. (2 hours)

Common Issues and Problems

Avoid common mistakes made when PV operation is not fully understood. (2 hours)

NEC Code Compliance

Identify key NEC requirements that are often not applied properly and avoid costly mistakes. (2 hours)



Bill Brooks, Trainer

Bill Brooks has been designing, installing, analyzing, and testing utility-interconnected PV systems since 1988. Over the past 7 years, Mr. Brooks' training has helped over 1,200 inspectors and over 2,500 electricians and installers understand the design and installation of code-compliant systems. His field troubleshooting techniques have been invaluable to attendees. Mr. Brooks holds Bachelor and Master of Science Degrees in Mechanical Engineering from North Carolina State University, is a Registered Professional Engineer in both North Carolina and California, and is the author of several technical manuals for the industry.

Who Should Attend?

Solar installers, electricians, building contractors, inspectors, and engineers.

Why You Should Attend?

To extend your understanding of design and installation techniques beyond the basic level.

When?

October 24, 2005
9 am – 5 pm (including lunch)
Registration opens at 8:30 am

Location?

Multi-purpose Room
PG&E Energy Training Center
1129 Enterprise St., Stockton, CA

Cost? \$30

**RSVP by October 20!
Space is limited!**

Contact? Nellie Tong

(510) 891-0446
nellie.tong@kema.com

NABCEP credit?

7 hours of credit
• 2 hours of Code
• 5 hours PV-specific training

**Contact Nellie Tong by October 20 at 510-891-0446 or
nellie.tong@kema.com to register!**

Detailed Agenda

for the

Intermediate PV Workshop

1. PV System Design and Installation Overview:
 - 1.1. Class Introductions
 - 1.2. PV characteristics—Understanding IV curves
 - 1.2.1. How curve changes with irradiance, temperature, and age
 - 1.3. Performance calculations with and without a computer
2. Current PV Products:
 - 2.1. Building-applied and building-integrated products
 - 2.2. Review of currently available standard modules and inverters
 - 2.2.1. Classifications of products by warranty, technology, company size, years in business, megawatts produced, etc...
3. Common Issues and Problems:
 - 3.1. Inter-row shading
 - 3.2. Effects of series versus parallel combining of PV modules
 - 3.3. DC voltage concerns
 - 3.4. AC voltage concerns
 - 3.5. Conductor temperatures and ampacities in typical PV systems.
4. NEC Code Compliance
 - 4.1. PV in the *NEC* and key 2005 *NEC* Article 690 code change issues
 - 4.1.1. Article 690.13 and 690.14 Disconnecting Means—clarification on location
 - 4.1.2. Article 690.35 Ungrounded Photovoltaic Power Systems (690.41 Exception for consistency)
 - 4.1.3. Article 690.64 options for connecting to an electrical service
 - 4.1.3.1. (B) (5) no clamping for 690.60 inverters
 - 4.2. Installation and Inspector Checklists
 - 4.2.1. How to know whether PV system power is acceptable or not
 - 4.2.2. Inspector Guidelines for PV Systems
 - 4.2.2.1. Permit Guidelines for Small-Scale PV Systems
 - 4.2.2.2. Inspection Guidelines for all PV systems